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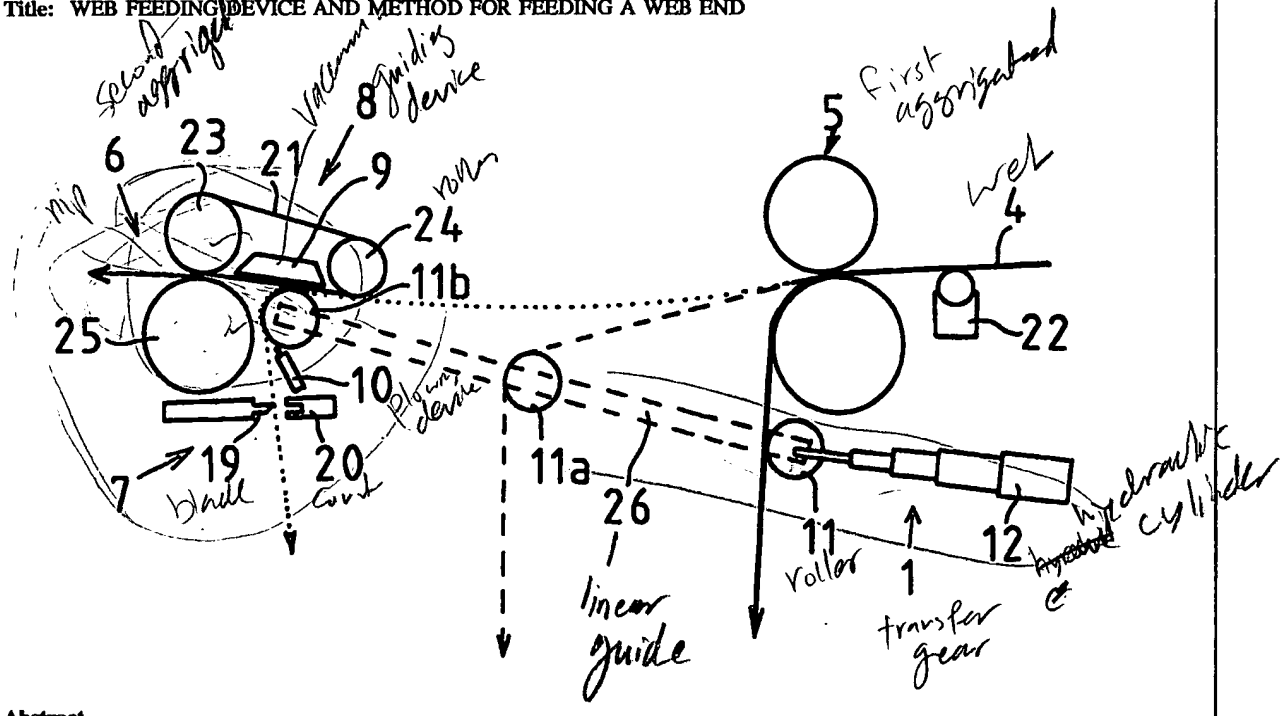

(57) Abstract

Web feeding device and a corresponding procedure for feeding the end of a web from a first aggregate to a second aggregate in a chemical pulp, cardboard or paper machine or in a machine for further processing of these, said web feeding device comprising a transfer gear (1, 2, 3) for guiding the track of the web (4) from the first aggregate (5) to the vicinity of the second aggregate (6). The transfer gear (1, 2, 3) comprises means for moving it between the first and second aggregates form the vicinity of the first aggregate to the vicinity of the second aggregate while the web is carried by the transfer gear.

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WEB FEEDING DEVICE AND METHOD FOR FEEDING A WEB END

The present invention relates to a web feeding device as defined in the preamble of claim 1 and to a procedure for web feeding as defined in the preamble of claim 18

The invention concerns especially chemical pulp machines and a procedure for feeding the end of a pulp web from one aggregate to another, e.g. from a drying chamber to a sheet cutter, in such machines. However, the invention is not restricted to this application, but it can also be used e.g. in conjunction with paper machines or cardboard machines as well as various machines for further processing of paper and cardboard

In conjunction with the treatment of light-weight webs, a commonly known technique to use an air blowing system for web feeding. However, in the case of thicker and heavier webs, the air blowing method is not workable and therefore a manual method is mainly used for web feeding e.g. in the case of a chemical pulp web.

Feeding the web end manually from one aggregate to another is a slow operation which constitutes a significant safety risk for the operating personnel. Especially in the case of long distances, manual web feeding is difficult because especially a thick high-grammage web generally has to be supported at intermediate positions instead of merely drawing by the end. On old, relatively slow machines, manual web feeding has been feasible, but as the speed is increasing, which is a natural trend of development even in chemical pulp machines, the manual web feeding process is difficult and is continuously becoming more and more so.

The object of the present invention is to eliminate the drawbacks mentioned above. A specific

object of the present invention is to disclose a new type of web feeding device and a corresponding procedure, which allow web feeding without the web being touched manually, especially in the case of a relatively heavy chemical pulp web.

As for the features characteristic of the invention, reference is made to the claims.

In the text to follow it will mainly be spoken of a web, and this may refer to the web in its entire width, but preferably it refers to a narrower leader which has been cut from one edge of the web and which is first fed to another aggregate and which can be used to draw the whole web in its entire width to the other aggregate.

The web feeding device of the invention for feeding a web end from a first aggregate to a second aggregate comprises a transfer gear for guiding the track of the web from the first aggregate to the vicinity of the second aggregate. According to the invention, the transfer gear comprises means for moving it from the vicinity of the first aggregate to the vicinity of the second aggregate while the web is resting on the transfer gear. In other words, as the web or a leader already cut is passing from the first aggregate to an exit space, e.g. to a pulper, the web is supported by means of the transfer gear and its track is removed so that the web runs from the first aggregate to the vicinity of second aggregate and only from there to the pulper.

The web feeding device preferably comprises a guiding device by means of which the web is passed into the second aggregate from its vicinity. Preferably the transfer gear is so disposed that it extends relatively close to the guiding device so that the web can be brought into contact with the guiding device by means of the transfer gear.

The guiding device may also consist of a mere roll nip, because e.g. in a cardboard machine application the web feeding device of the invention can be used e.g. for web feeding between the drying section and the machine calender. In this case, the leader can be conveyed to the vicinity of the calender, cut off and passed directly to the nip without actually using roller belts or equivalent.

In an embodiment of the invention, the web feeding device comprises a cutting device placed in the vicinity of the second aggregate for cutting off the leader and passing the cut end to the second aggregate. The cutting device preferably consists of a blade and a counter blade disposed in the vicinity of the second aggregate, between which the web is cut off. Of course, other types of known cutting devices and means may be used.

Thus, in the web feeding device of the invention, the web coming from the first aggregate is first moved by means of a transfer gear so as to make it run in the vicinity of the second aggregate. After this, using the cutting device, the web end can be cut off in the vicinity of the second aggregate and, by means of the guiding device, the cut end is conveyed to the second aggregate. Another alternative is to pass the web or leader in a doubled condition into the nip formed by the roller and the guiding device, whereupon it either breaks or is cut off. It is also possible that part of the leader that remains intact rises up from the pulper and passes through the nip.

The transfer gear preferably comprises a rotatably mounted reel or roller. Connected to the reel or roller is a suitable power means for moving it from the vicinity of the first aggregate to the vicinity of second aggregate while at the same time the web is supported by it and thus runs over said reel or roller.

The power means used to move the reel or roller may consist of e.g. a cogged-belt driven linear guide, a telescopic cylinder, various lever structures, rail systems or equivalent along which the reel or roller can move. Similarly, the transfer gear may comprise several reels or rollers supporting the web between the first and second aggregates. The roller or reel at the end of the transfer gear which is used to push the web may also be provided with a drive, in which case it will be able to guide the web more accurately while its own movement towards the second aggregate is taken into account. In this way, the web can also be drawn if necessary while its track is being shifted.

In an embodiment of the invention, the transfer gear consists of an endless belt running on rollers, together with means for tension adjustment, at least one of the rollers being movable between the first and second aggregates. In this case, when the track of the web is being guided by means of the movable roller from the first aggregate to the second aggregate, the web is supported on the endless belt and the track of the web is removed until the web runs near the second aggregate.

The guiding device preferably comprises an endless circulating belt connected to the second aggregate, e.g. to the leading roll of the second aggregate. The endless belt of the guiding device is preferably disposed above the web running in the vicinity of the second aggregate so that the web or its cut end can be brought into contact with the lower surface of the belt, thus allowing the web end to be conveyed, guided by the lower surface of the belt, to a desired point in the second aggregate.

In a preferred case, the guiding device is provided with contact elements enabling the upper surface of the web to be brought into contact with the

guiding device or maintained in contact with the guiding device. Preferably the contact elements consist of vacuum means, placed e.g. on one side of the endless belt of the guiding device, by means of which a suction acting through the belt is generated to keep the web or web end brought by the transfer gear in contact with the guiding device.

If the transfer gear does not bring the web or its end to a sufficient contact with the guiding device, then the contact elements may also comprise a blowing device to guide or push the web or its cut end into contact with the lower surface of the endless belt of the guiding device. It is also possible to maintain this contact by means of the blowing device until the web or its end reaches the nip of the second aggregate, in which case the use of vacuum means and suction through the belt may be unnecessary.

The web feeding device preferably comprises a cutter by means of which a leader known in itself is cut from the web, which leader is first passed to the second aggregate using a web feeding device according to the invention. After the leader has been conveyed to the second aggregate, the width of the leader can then be increased by means of the cutter so that finally the web in its entire width runs from the first aggregate to the second aggregate.

In the procedure of the invention for feeding a web from a first aggregate to a second aggregate in a chemical pulp, cardboard or paper machine, in an initial condition the web is driven down from the first aggregate to an exit space, such as e.g. a pulper. According to the invention, the track of the web or a leader cut from it is removed at a speed below the running speed of the web to make it run from the vicinity of the first aggregate to the vicinity of the second aggregate and further to where it has been running, e.g. to a pulper. In other words, during the

removal of the web track, the web continues to be passed into the exit space. Thus, in the invention, a bearing supporting the web is moved at a speed below the running speed of the web toward the second aggregate while the web is running into an exit space, such as a pulper.

In a preferred embodiment, after the running track has been moved, the upper surface of the leader is brought into contact with the guiding device, which guides the web and leads it to the second aggregate. Thus, the web is drawn in contact with the guiding device to the second aggregate.

The web or leader is held in contact with the guiding device preferably using either a vacuum method or a blowing method or both.

The web is preferably passed from one aggregate to another at a clearly lower speed than the web speed. The speed may be e.g. 30-60 m/min or only about 2% of the web speed.

In the procedure of the invention, the web or leader may be cut off at a point near the second aggregate so that the cut end is taken to the second aggregate. However, it is also possible that no cutting is done but the web or leader extending past the second aggregate is bent over and passed in a doubled condition to the nip between the roller of the second aggregate and the guiding device.

The web feeding device of the invention and the corresponding procedure provide significant advantages as compared with prior art. The invention enables automatic web feeding without the web being touched manually. Thus it significantly improves industrial safety. Likewise, as machine speeds are increasing, it eliminates an operation that has become more difficult than before and thus promotes the conditions for further increasing the speeds. The device takes up only a small space beside the machine

as it only moves along tracks substantially parallel to the machine. The invention allows the web feeding operation to be performed at a speed that is independent of the speed of the web in the machine. The web end can be passed from a first aggregate to a second aggregate at a speed of about 30 - 60 m/min while the machine speed is 1000 (paper machine), 500 (cardboard machine) or 100 m/min (pulp drying machine), with the invention taking care of directing the faster running leader e.g. to a pulper. The speed of the web feeding process itself can be selected so that maximum success in the web feeding operation is achieved. The web feeding speed may be only e.g. about 2% of the web speed.

In the following, the invention will be described in detail by referring to the attached drawings, wherein

Fig. 1 presents a diagram representing a web feeding device according to the invention in side view,

Fig. 2 presents another embodiment of the invention in top view,

Fig. 3 presents a third embodiment of the invention in side view,

Fig. 4 presents a fourth embodiment of the invention in side view, and

Fig. 5 presents a diagram illustrating the basic principle of the invention.

In the web feeding devices presented in the figures, the same parts are indicated by the same reference numbers. In the embodiment in Fig. 1, the web feeding device comprises a transfer gear 1 disposed in the vicinity of a first aggregate 5 and the web 4 coming out of it. The transfer gear consists of a roller 11 rotatably mounted with bearings and connected to a telescopic hydraulic cylinder 12 and supported by a linear guide 26 extending from a point below the first aggregate 5 to a point near a second aggregate 6.

Disposed in the vicinity of the second aggregate 6, to which the end of the web 4 is to be fed, is a guiding device 8, which consists of an endless belt 21 supported by and driven around rollers 23 and 24. Roller 23 rests on the leading roll 25 of the second aggregate 6. Thus, a nip is formed between the rollers 23 and 25, into which the web end is to be conveyed. Moreover, disposed above the lower portion of the belt 21 are vacuum means acting as a contact element 9, which are used to generate a suction through the belt 21 to keep the web in contact with the lower surface of the web.

The web feeding device also comprises a blowing device acting as a second contact element 10, which can be used to produce an air blast to push the web in a desired direction. In addition, the web feeding device comprises a cutting device 7 disposed in the vicinity of the second aggregate 6, consisting of a blade 19 and a counter blade 20, by means of which the web running between them can be cut.

Disposed in the vicinity of the first aggregate 5 is also a slitting device 22, which cuts from the web 4 a narrow leader which can be fed to the second aggregate 6 first.

The device illustrated by Fig. 1 works as follows. In the initial situation, the web 4 is running from the first aggregate 5 directly down e.g. to a pulper. When the web 5 is to be passed from the first aggregate 5, e.g. a drying chamber, to the second aggregate 6, e.g. a sheet cutter, a narrow leader is cut from the web using the slitting device 22. The rest of the web continues to be passed down directly to the pulper. The leader also continues to run to the pulper, the transfer gear 1 pushes the leader along the linear guide 26 towards the second aggregate 6, intermediate position 11a, right up to it to a position 11b below the endless belt 21 of the guiding device 8. The web

can be pushed into direct contact with the guiding device or it can be left at a short distance from it.

In this position, the leader still continues to run around the roller 11 and down to the pulper. Using the cutting device 7, the leader is now cut off and at the same time a blast is applied by the blowing device 10 to force the cut end of the leader up towards the lower surface of the endless belt 21 of the guiding device 8. Due to the action of the vacuum means 9, the end of the leader remains in contact with the lower surface of the belt 21, and while the belt 21 is being driven around the rollers, it takes the leader end along with it through the nip between rollers 23 and 25 to the second aggregate 6.

After this, using the slitting device 22, the width of the leader now running to the second aggregate 6 can be increased until finally the web 4 in its entire width is running to the second aggregate 6. When the web is running smoothly from the first aggregate to the second aggregate, the guiding device 8 or at least one 23 of its rollers is raised so that the belt 21 is disengaged from contact with the leading roll 25 of the second aggregate 6.

Fig. 2 presents another embodiment of the invention, which mainly corresponds to the embodiment in Fig. 1. The difference lies in the structure of the transfer gear, which consists of a cog-belt driven linear guide 26 on which a roller 11 is supported by a carriage 27. Thus, the roller 11 can take the leader 28 from the first aggregate 5 to the guiding device 8 in the vicinity of second aggregate 6. As can be seen from the figure, the web feeding device takes up but a very small space beside the machine. The web feeding roller 11 itself need not be pulled transversely out of the machine, but it can be brought to an initial position below the first aggregate 5. Thus, in a situation where the web feeding operation fails for some reason, the

web feeding roller can simply be driven back to its initial position, and once the leader is again running normally, the web feeding operation can be started again.

Fig. 3 presents a third embodiment which mainly corresponds to the embodiment in Fig. 1 in respect of both structure and operation. The only difference is the transfer gear 2, which consists of an endless circulating belt 16 running around several rollers. The belt has been arranged to run via tensioning devices 17 known in themselves because, as in the embodiment in Fig. 1, one 18 of the rollers can be moved from the vicinity of the first aggregate 5 to the vicinity of the second aggregate 6. When the roller 18 is moved towards the second aggregate 6, the web 4 will be running along the surface of the belt 16 and is supported by it throughout the distance between the first and second aggregates. This is to ensure that even a heavy web or leader will run smoothly forward. In other respects, the device works in a manner corresponding to the device in Fig. 1.

Fig. 4 presents a fourth embodiment, in which the transfer gear 3 consists of a pair of rollers 15 movable along a rail 13. The rollers 15 are connected to each other via a power means 14, i.e. a telescopic structure that allows adjustment of the distance between the rollers. Thus, by moving the roller pair along the rail while the distance between the rollers is changing, the web 4 can be removed from the vicinity of the first aggregate 5 to the vicinity of the second aggregate 6. It is also possible to have the rollers connected to each other via a suitable linkage structure allowing them to be moved farther apart or closer to each other in the direction of the rail 13. After the web 4 or a leader cut from it has been removed in this way to the vicinity of the second

aggregate 6, the web end is fed to the second aggregate 6 in the manner described in connection with Fig. 1.

Fig. 5 is diagram representing the basic idea of the method of the invention. The first aggregate 5 may consist of e.g. a drying cylinder section where the web 4 is circulating from one drying cylinder to the next. In the initial situation, the web 4 is passed from a first aggregate directly down to an exit space 30, which may be a pulper. When it is desirable to have the web 4 running to a second aggregate 6, e.g. a size press, a transfer gear 31 is engaged to support the web on it in the vicinity of the first aggregate 5. Next, the transfer gear is moved to the vicinity of the second aggregate while the web is supported by the transfer gear, thus removing the track of the web so as to make it run close by the second aggregate. At the same time, however, the web is running to the exit space 30 all the time during the removal. In this way, the removal can be achieved tranquilly and slowly, at a speed substantially lower than the running speed of the web, so the speed of removal of the track is independent of the running speed of the web.

Once the web has been brought to run along a track close by the second aggregate 6, the web can be e.g. cut off and its end can be conveyed into the nip of the second aggregate, for it is always necessary to have some type of nip (roll nip, belt nip, roll/belt nip, rope nip, and so on) into which the web is directed to create a pull on it.

In the foregoing, the invention has been described by way of example by the aid of the attached drawings, but different embodiments of the invention are possible within the scope of the inventive idea defined by the claims.

CLAIMS

1. Web feeding device for feeding the end of a web from a first aggregate to a second aggregate in a chemical pulp, cardboard or paper machine or in a machine for further processing of these, said web feeding device comprising a transfer gear (1, 2, 3) for guiding the track of the web (4) from the first aggregate (5) to the vicinity of the second aggregate (6), characterised in that the transfer gear (1, 2, 3) comprises means for removing it between the first and second aggregates from the vicinity of the first aggregate to the vicinity of the second aggregate while the web is supported by the transfer gear.

2. Web feeding device as defined in claim 1, characterised in that the web feeding device comprises a guiding device (8) for conveying the web brought by the transfer gear to the vicinity of the second aggregate to the second aggregate.

3. Web feeding device as defined in claim 2, characterised in that the transfer gear has been arranged to bring the web track into contact with the guiding device (8).

4. Web feeding device as defined in claim 1, characterised in that the transfer gear (1) comprises a rotatably mounted reel or roller (11) with a power means (12) connected to it to allow it to be moved from the vicinity of the first aggregate (5) to the vicinity of the second aggregate (6), the web (4) being carried by said reel or roller.

5. Web feeding device as defined in claim 4, characterised in that the transfer gear comprises a drive for pulling the web during the removal.

6. Web feeding device as defined in claim 4, characterised in that the power means (12) consists of a telescopic cylinder.

7. Web feeding device as defined in claim 4, characterised in that the power means consists of a lever or arm structure.

8. Web feeding device as defined in claim 4, characterised in that the power means consists of a rail system (13) with a power means (14) for moving rollers (15).

9. Web feeding device as defined in claim 1, characterised in that the transfer gear (2) comprises an endless belt (16) together with tension adjustment means (17) and a movable roller (18), allowing the web (4), supported by the belt to, to be removed to the vicinity of the second aggregate (6).

10. Web feeding device as defined in claim 1, characterised in that the web feeding device comprises a cutting device (7) for cutting off the web end in the vicinity of the second aggregate.

11. Web feeding device as defined in claim 10, characterised in that the cutting device (7) comprises a blade (19) and a counter blade (20) disposed in the vicinity of the second aggregate.

12. Web feeding device as defined in claim 2, characterised in that the guiding device (8) comprises an endless circulating belt (21) so arranged that its lower surface conveys the web (4) or its cut end to the second aggregate (6).

13. Web feeding device as defined in claim 2, characterised in that the web feeding device comprises contact elements (9, 10) for bringing the upper surface of the web into contact with the guiding device (8).

14. Web feeding device as defined in claim 13, characterised in that the contact elements (9) comprise vacuum means for keeping the web (4) in contact with a belt (21) and passing it by means of the belt to the second aggregate (6).

15. Web feeding device as defined in claim 13, characterised in that the contact elements (10) comprise a blowing device for raising the web or its cut end into contact with the lower surface of the belt (21).

16. Web feeding device as defined in any one of claims 1 - 15, characterised in that the first aggregate (5) is the drying section of a chemical pulp machine and the second aggregate (6) is the sheet cutter of the chemical pulp machine.

17. Web feeding device as defined in any one of claims 1 - 16, characterised in that the web feeding device comprises a slitting device (22) for cutting a leader from the web (4), the leader being passed to the second aggregate first.

18. Procedure for feeding a web end from a first aggregate to a second aggregate in a chemical pulp, cardboard or paper machine, in which, in the initial condition of the procedure, the web is driven down from the first aggregate to an exit space, e.g. a pulper, characterised in that, in the procedure, the track of the web is removed by means of a transfer gear at a speed below the running speed of the web from the vicinity of the first aggregate to the vicinity of the second aggregate.

19. Procedure as defined in claim 18, characterised in that, during the removal of the running track of the web from the vicinity of the first aggregate to the vicinity of the second aggregate, the web continues to be passed into the exit space.

20. Procedure as defined in claim 18, characterised in that the upper surface of the web is brought into contact with a guiding device guiding and conveying the web to the second aggregate and the web is conveyed to the second aggregate in contact with the guiding device.

21. Procedure as defined in claim 18, characterised in that the contact with the guiding device is maintained via application of underpressure.

22. Procedure as defined in claim 18, characterised in that the contact with the guiding device is maintained via application of blowing.

23. Procedure as defined in claim 18, characterised in that the web is drawn by means of the transfer gear during the removal.

24. Procedure as defined in any one of claims 18 - 23, characterised in that a leader is cut from the web and taken to the second aggregate first.

25. Procedure as defined in any one of claims 18 - 24, characterised in that the web or leader is cut off at a point near the second aggregate, whereupon the cut end of the web is conveyed to the second aggregate by means of the guiding device.

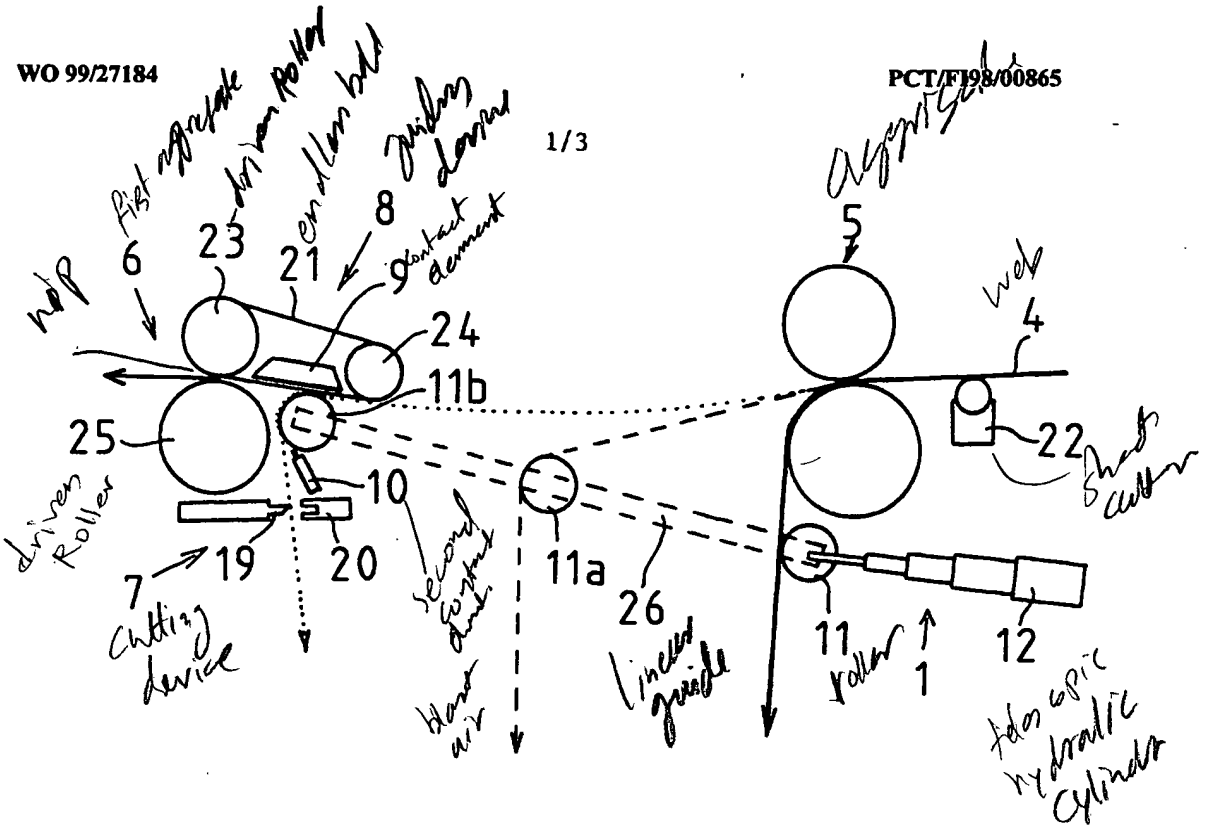
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Fig 1

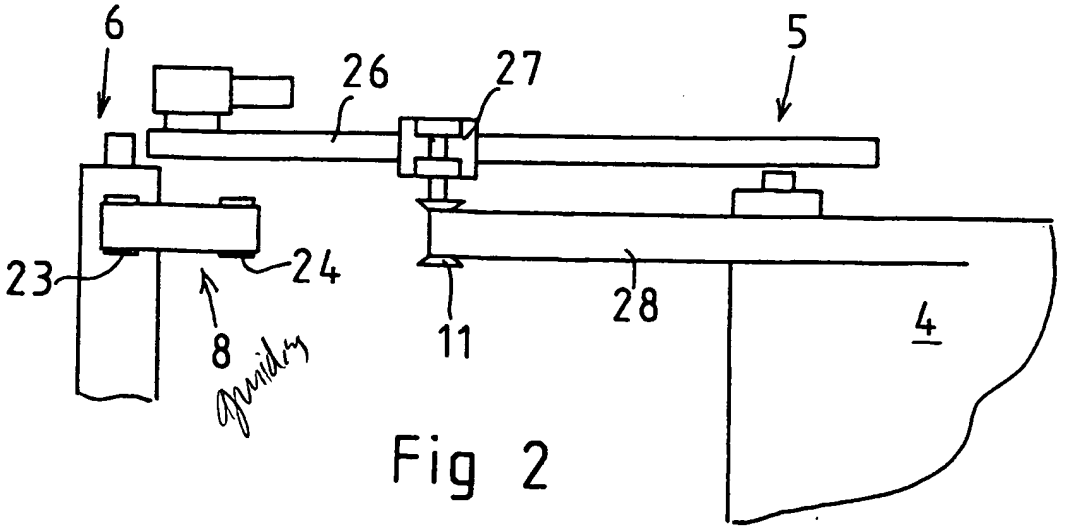
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Fig 2

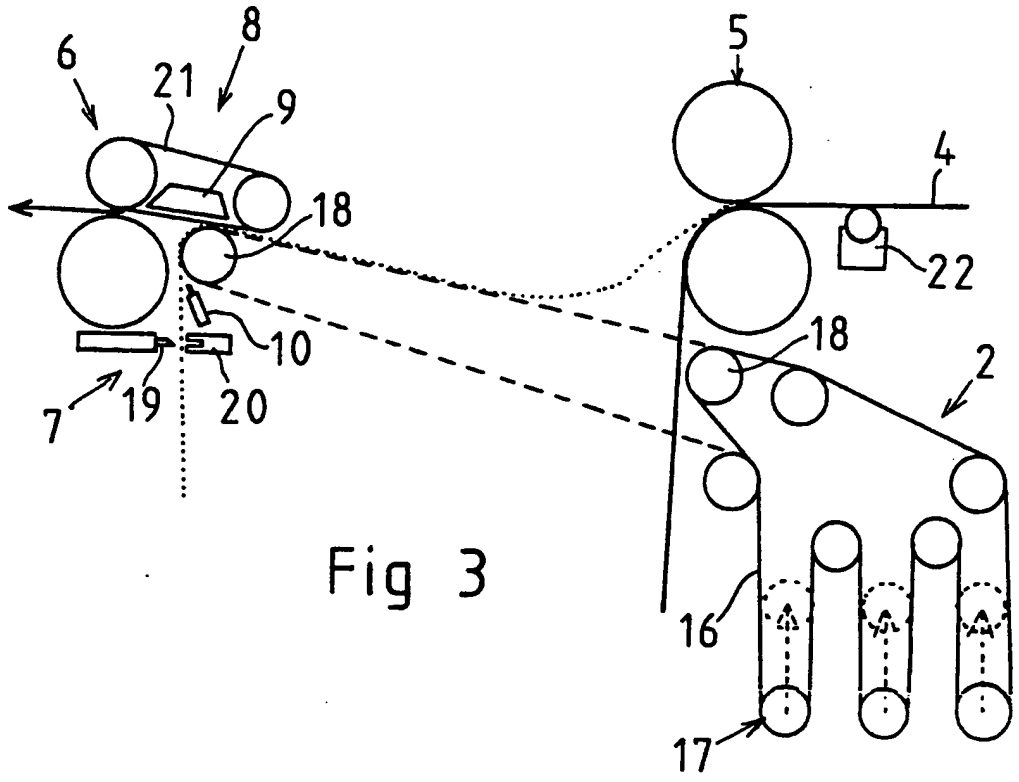

Fig 3

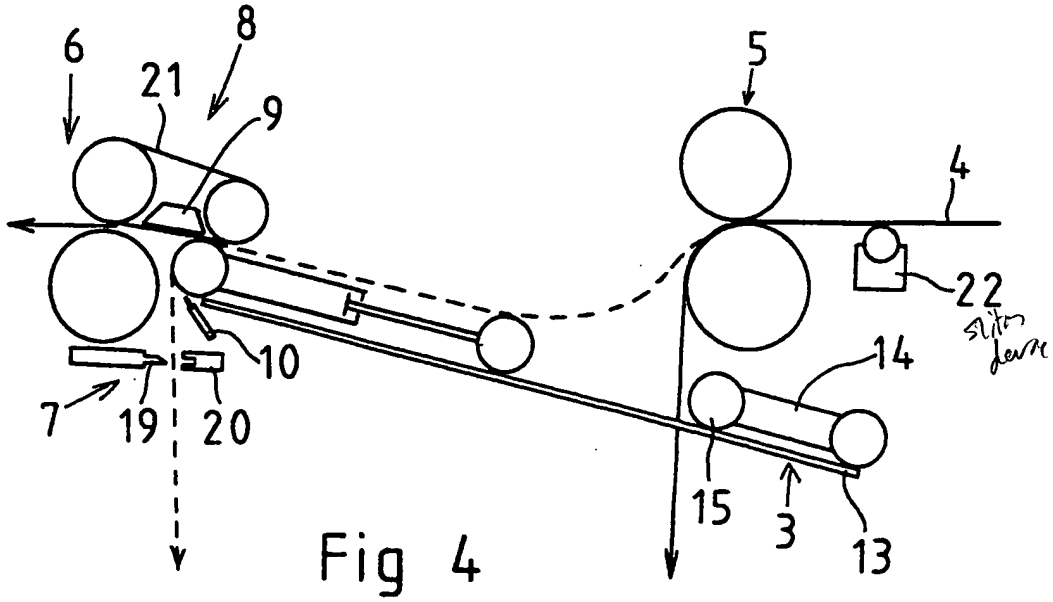

Fig 4

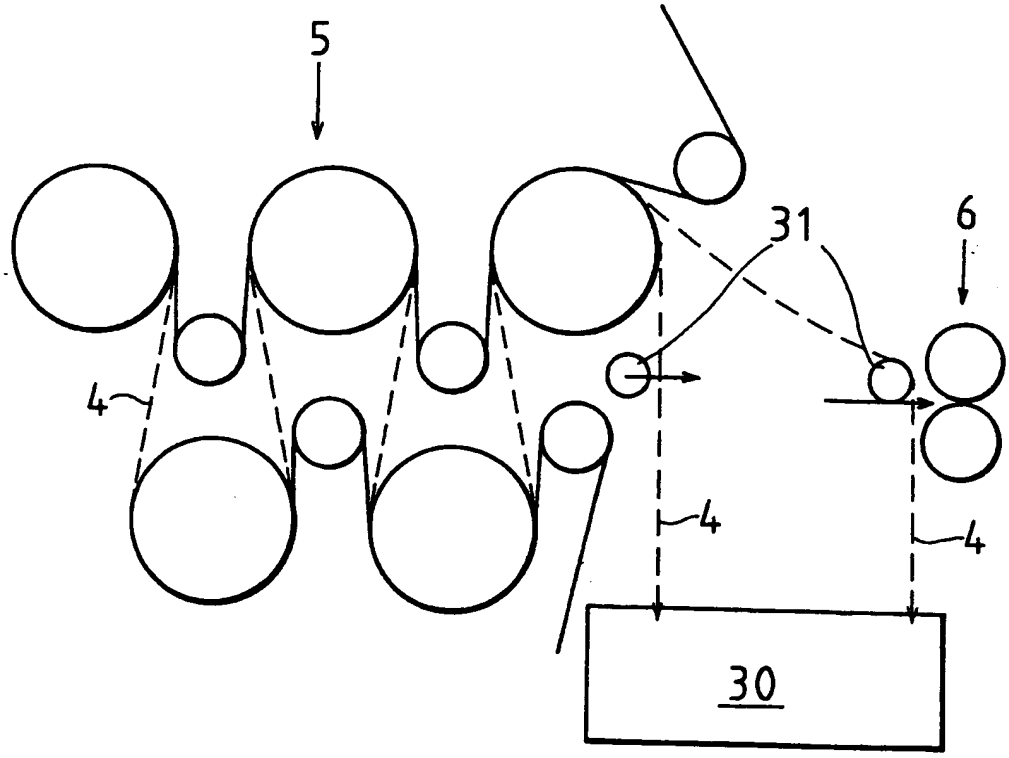

Fig 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00865

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21F 7/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1533720 B (SIDNEY C. ROONEY), 29 November 1978 (29.11.78), page 3, line 7 - line 120, figures 1-4, claims 1-16	1-25

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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1533720 B	29/11/78	DE 2636887 A,B,C	10/03/77
		FI 61331 B,C	31/03/82
		FI 761364 A	19/02/77
		FR 2321441 A,B	18/03/77
		SE 397548 B,C	07/11/77
		SE 7509205 A	19/02/77
		AT 144077 A	15/04/79
		AT 353598 B	26/11/79
		BE 852719 A	18/07/77
		CH 617477 A	30/05/80
		FI 57990 B,C	31/07/80
		FI 763617 A	23/09/77
		NL 172139 B,C	16/02/83
		NL 7703019 A	26/09/77
		SE 420431 B,C	05/10/81
		SE 7613943 A	23/09/77
		US 4022366 A	10/05/77